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TRANSDUCER CALIBRATION SYSTEMS.(U)
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UNCLASSIFIED N00024-67-C-1211
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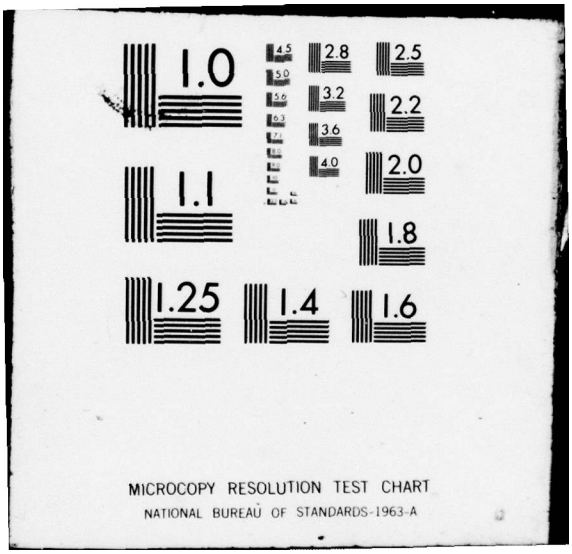
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UNCLASSI

INTERIM DEVELOPMENT REPORT,

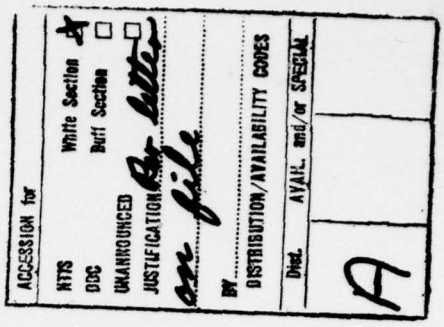
FOR 11 Jan - 30 Jun

TRANSDUCER CALIBRATION SYSTEMS,

This report covers the period 11 January 1967 through 3

SCIENTIFIC-ATLANTA, INC.
P. O. Box 13654
Atlanta, Georgia 30324

NAVAL SHIP SYSTEMS COMMAND



PART I

A. PURPOSE

1. This report summarizes work accomplished under Naval Ship Systems Command Contract N00024-67-C-1211 for the period 11 January 1967 through 30 June, 1967.

2. The purpose of this contract is to design, develop, fabricate and install four (4) transducer calibration systems for transducer repair facilities at naval shipyards. This work is being performed in accordance with the contractors technical proposal number 82108, dated 29 September 1966 subject to technical instructions from the Commander, Naval Ship Systems Command, SHIPS 1622D. This contract originally established a priority of delivery as follows:

First System - Boston Naval Shipyard

Second System - Mare Island Division, San Francisco Bay Naval Shipyard

Third System - Pearl Harbor Naval Shipyard

Fourth System - Boston Naval Shipyard

3. Attention is directed to Naval Ship Systems Command Contract N00024-67-C-1385 dated 29 May 1967. Under this contract the government is to furnish a number of pieces of equipment for use in fabricating the four systems.

4. Attention is also directed to Contract Number NObsr-93125 dated January 31, 1967. Under this contract the contractor was to deliver a transducer calibration system to the University of Texas, Defense Research Laboratory, Austin, Texas. This system was to be nearly identical to the four systems for the naval shipyards.

5. The technical representative of the Commander, Naval Ship Systems Command, SHIPS 1622D, has instructed the contractor to disregard the original priority of delivery. The contractor was instructed instead to design, develop, fabricate and to install the University of Texas transducer calibration system (see paragraph 4, above) at the Pearl Harbor Naval Shipyard Transducer Repair Facility.

6. The contractor has further been instructed to deliver the first system under Contract N00024-67-C-1211 (see paragraph 1, above) to the Mare Island Division, San Francisco Bay Naval Shipyard Transducer Repair Facility. The new priority of delivery for the remaining three (3) systems is to be established later.

7. The change in priority of the delivery of the four (4) systems does not alter the original schedule of delivery of the contract.

However, because the DRL system is nearly identical to the other four (4) systems, the effect of the reassignment of priorities was to make the DRL system "System 1" in the original priority list.

8. This report, therefore, summarizes work accomplished under both of the contracts, which in aggregate, is for delivery of five (5) systems. The direct labor hours, reported in the following paragraph, are for the four (4) shipyard systems only.

B. GENERAL FACTUAL DATA

The following employees of the contractor, and the man-hours work performed by each during the period covered by this report, is tabulated below;

NAME	TITLE	HOURS
Bradford, J. A.	Technician, Special Systems	35
Coker, W. R.	Technician, Special Systems	208
Fulmer, H. R.	Manager, Special Systems	89
Hart, J. A.	Engineer, Special Systems	323
Hollis, J. S.	Principal Engineer, Research	41
Hutchins, S. F.	Staff Engineer, Research	14
James, C. E.	Product Manager, Underwater Sound Instrumentation	204
Lyon, J. T.	Manager, Electromagnetic Studies	12
Phillips, L. J.	Technician, Special Systems	55
Pippin, J. E.	Director, Research	63
Wilkerson, J. E.	Engineer, Special Systems	343

C. DETAILED FACTUAL DATA

1. Delivery of the DRL System

a. General

A Scientific-Atlanta Model 1100-82139 Transmission Measurement System was shipped to the Pearl Harbor Naval Shipyard by air freight on May 12, 1967. Mr. Curtis E. James went to Pearl Harbor for the period of May 22 thru June 2, 1967 to assist in the installation and to conduct training sessions.

b. Installation

The equipment had arrived in good physical condition, had been uncrated by shipyard personnel and had been put in place. It is located in a building which the shipyards Combat Systems Division has had moved onto the concrete pier at their transducer calibration facility.

It had originally been the intent of the contractor to ship the system to Pearl Harbor and supply insturctions for installation by shipyard personnel. The object of this was to allow as much time as possible for the technical training. In order to carry out this intent, an exchange of correspondence took place between the contractor and Lt. J. B. Wilcox, Superintendent of the Combat Systems Division. Generally, this correspondence related to the interface of the equipment being delivered by the contractor, with the equipment and the facilities being furnished by the shipyard. Instructions were given for fabrication of most of the interconnecting cables. (Where lengths, terminations, or hardware for fabricating the remaining cables could be determined, or were of a special nature, they were fabricated by the contractor and shipped to the shipyard.)

After the system had been disassembled for shipment, it was felt that the re-assembly, although not complicated, was too hard to describe by letter, and the shipyard was informed that assembly would be done by the contractor.

Unfortunately, the shipyard had not been able to schedule the fabrication of the cables, so that a considerable amount of training time was lost.

Most of the first day was spent reassembling the console. Power was not available to turn the system on until Wednesday morning of the first week. Most of Wednesday was then spent verifying that the equipment was operating normally. The rest of Wednesday, Thursday, and part of Friday were spent fabricating the interface cables.

The training sessions were formally started on Friday afternoon. They were completed on Tuesday.

It was hoped that demonstrations of calibration techniques, using actual transducers in the water could start Wednesday morning, but, unfortunately, no projectors were available. A TR139 element was used to demonstrate how the equipment furnished was to be used to plot low-power, CW, impednace loops in air.

Thursday was spent looking at two interface problems. The first of these problems dealt with the operation of the FQM-1 Training Mechanism. During an inspection of the facilities at Pearl Harbor, on March 13 and 14, by Messrs. Hugo Fulmer and Curtis James, the shipyard was advised to look into the possibility of building a control panel for the FQM-1 Training Mechanism that would operate as a rate control for it. The shipyard was to construct this panel, and it was then to be mounted in the contractor's console.

The shipyard had constructed the panel, but could not provide rate control. Consequently, it provided almost no control over the training mechanism speed and regulation. The contractor attempted to look at this system, to impliment a rate control, but this could not be done with the available facilities.

The second problem looked at dealt with the presence of interfering signals in the two instrumentation racks furnished by the shipyard. Because of the tight schedule, the shipyard had not been able to devote any time to planning the grounding of the overall facility. Most of Thursday was spent helping shipyard

personnel plan a ground system, and installing some of it. Scientific-Atlanta had previously advised the shipyard of the probability that RFI filters would have to be installed in the power lines entering the building to eliminate RFI, and it may turn out that this will be required to solve the problems.

Late Thursday afternoon, a projector for an SQS-4 was delivered to the facility, however, it could not be put in the water until that night.

On Friday morning, the last day of the training session, the projector was in the water, and demonstrations were given. It was possible to measure beam patterns and source level. It was not possible to measure frequency response, or use the equipment associated with the semi-automatic frequency response sub-system in the console. This is because the only power amplifier available at the calibration facility has a high-Q tuned class C output stage that will not operate off-frequency. Neither was it possible to demonstrate operation of the Voltage-Current Normalizer, because this power amplifier has heavily clipped preamplifier stages that make the output signal independent of the input signal.

On Friday a summary memorandum was prepared which recommended what action the Combat Systems Division might wish to take to clear up the remaining problems and to maintain the equipment and the facility in good operating condition. Since Lt. Wilcox, the Combat Systems Superintendent was absent, the memorandum was submitted to Mr. J.A. Woodman, Chief Combat Systems Engineer.

This memorandum covered the following points:

(1) A strong training program should be instituted which has as its objective the familiarization of all operating and direct line supervisory personnel with the equipment that has been installed. This program should cover the following activities, as a minimum:

(a) The principle of operation, front panel controls, input and output connectors, maintainence and calibration sections of each of the instruction manuals for instruments in the console should be studied on a routine schedule.

(b) A schedule should be devised which, on a routine basis, should schedule calibration and preventive maintenance procedures.

(c) The overall system block diagram should be studied until the inter-relationship of all components is essentially memorized, and their inter-connection to perform specific tests becomes second-nature.

(2) Detailed and formal diagrams should be prepared to document the following:

(a) All of the cables that have been installed between the SA console, the power amplifier, the magnetic servo amplifier, and the rack containing the stave selector panel.

(b) The AC power wiring to the building, including the grounds of all pieces of equipment. These diagrams should show electrically and goemetrically where the grounds are made.

(c) All of the auxiliary items used in conjunction with the system, such as, the stave selector panel, the capacitor tuning panel, the training mechanism control panel, etc.

(3) The electricians should finish the AC wiring to the building. All of the convenience outlets should be properly polarized. The air conditioners should be installed.

(4) Long-lead replacement spare parts should be procured. Expendable supplies (paper, pens, ink, etc.) should be procured on a max/min inventory basis.

(5) An engineer should be assigned to look into the elimination of the 10 MHz amplitude modulated interference that permeates the building. These signals do not appear on the SA console, because of the self-contained grounding system. It may be necessary to install the low-pass power-line filters that SA had previously recommended.

(6) An engineer should be assigned to look into the source of, and the elimination of the 4.5 amp DC ground current that flows when the new building is strapped to a salt-water ground.

(7) An engineer should be assigned to modify the present training mechanism control panel so that it can be operated in a true rate (speed-regulated) mode.

c. Conclusions

The following two recommendations are made, in addition to the recommendations given to the shipyard in the memorandum summarized above.

1. The high power amplifier now being used has characteristics that make it unsuitable for calibration purposes with the new equipment. The output stage is tuned Class-C. Thus it will deliver significant power only at the resonant frequency of its output tank circuit. The driver stages are over-driven and heavily clipped. Thus the EI normalizer cannot be used to control its power output by adjusting the level of the input signal. It is recommended that the Pearl Harbor Naval Shipyard be furnished at least one of the twenty 3-KVA power amplifiers being furnished to this program by CML, as soon as possible.

2. The dependence upon the shipyard crane, and the lack of a hoist mechanism seriously restrict the ability of the present facility to take advantage of the new equipment. Installation of a mono-rail supported crane will help somewhat, but it would still be inconvenient to rapidly install and remove single transducer elements.

2. Work Accomplished Under Contract N00024-C-1211

A great part of the effort directed toward the over-all intent of this contract -- to furnish standard calibration systems to the three major naval shipyard transducer repair facilities -- has been expended in delivering the DRL system to the Pearl Harbor Naval Shipyard. The reason for doing this was explained in the preceding paragraph A. Effort charged to the above named contract was primarily channeled into two areas:

a. Inspection and Study of Facilities

(1)Pearl Harbor Naval Shipyard

Messrs. Hugo Fulmer Fulmer (Product Line Manager, Special Systems) and Curtis James (Product Manager, Underwater Sound Instrumentation) visited the Pearl Harbor Naval Shipyard on March 13th and 14th. During this period, Messrs. Herman Evans (Naval Ship Systems Command) and Dudley Baker (Defense Research Laboratory, University of Texas) were also present.

A meeting was held to advise Pearl Harbor of the nature of the system being furnished. This included general information as capabilities, size, and weight of the shipment, method of shipment and estimated shipping schedule. Their facility was then inspected to discover what interface problems would exist between the new equipment and the on-site equipment that was to be retained. A second meeting was then held, at which time the shipyard was advised of what they would be required to do to eliminate these problems.

(2) Mare Island Division, San Francisco Bay Naval Shipyard

The inspection and study of the facilities at Mare Island was made during the return trip from Pearl Harbor on March 16th. Mr. Dudley Baker was not present on this trip. The meetings held here paralleled those conducted at Pearl Harbor.

3. Observations Transmitted to the Naval Ship Systems Command

On March 21st, a letter was transmitted to Mr. Herman Evans, summarizing observations that were made at the Pearl Harbor and Mare Island Naval Shipyards. A copy of that letter is included with this report in the correspondence appendix.

Paragraph 1 of that letter addressed itself to a problem that still exists. It was therein pointed out, that for Scientific-Atlanta to do an effective job in carrying out the intent of the contract, it would be highly desirable to have technical data which gives nomenclature and specifications of the projectors with

which the shipyards are required to deal. Scientific-Atlanta has acquired some of this information, but it is fairly old, and hence does not include the later, but widely used projectors and their modifications. In a telephone reply to this matter, Mr. Evans indicated that he had commissioned Stanford Research Institute to compile such data.

Four problems were discussed under paragraph 2 of this letter. Subsequent information was made available to Scientific-Atlanta by Pearl Harbor which permitted the last three problems to be solved. The remaining problem was the design of a sampling box for the EI Normalizer so that it could properly handle Pearl Harbor's power amplifier.

This problem arose because the system delivered to Pearl Harbor was actually funded through the Defense Research Laboratory of the University of Texas. The original proposal to DRL did contain an amount of money and labor to design this item, but it was subsequently removed from the contract at the request of Mr. Dudley Baker. Each of the four systems which will be delivered under the contract with the Naval Ship Systems Command will have such a unit as designed by Scientific-Atlanta. This design will be made compatible with additional requirements which are placed upon this item by the Pulse Vector Voltmeter.

The lack of having this unit does not hamper the immediate operations of the facility at Pearl Harbor, because of the fact that their power amplifier has characteristics that would preclude its effective use in any case.

The third paragraph of this letter pointed out the fact that much of the equipment in the console was not required for "run-of-the-mill" daily testing of high-power projectors; it being more suitable for the testing of low-level hydrophones. Mr. Evans has since pointed out that the shipyards and the interested technical people at the naval laboratories are well aware of this, and that the equipment was included to give the shipyards a complete test and evaluation capability beyond their present scope of work.

The final paragraph of this letter requested a redefinition of the scope

of the study portion of the contract. This point was subsequently cleared up by a meeting in Washington between Scientific-Atlanta personnel and the Naval Ship Systems Command. It was agreed that another meeting would take place in Atlanta at the contractors plant on June 8th and 9th, at which time the Naval Ship Systems Command would receive a presentation on this subject by Scientific-Atlanta.

b. Development of the Pulse Vector Voltmeter

This instrument is being developed so that impedance measurements can be made on transducers under pulse conditions at rated power. The concept and planning stage of the development is complete, the circuit design phase is 90% complete, and the construction of the first prototype is 15% complete.

3. Visit by Personnel from Naval Ship Engineering Center

On April 26, Messes. James Riley and Dale West from the Naval Ship Engineering Center, visited Scientific-Atlanta. The purpose of their visit was to pass on information that they had been gathering relative to the measurement of impedances of elements of one of the SQS 23 projectors. Most of their data referred to the TR 208. They indicated that there was a strong indication that this type of measurement, when made at rated power under pulsed conditions may very well be one of the most important single types of measurements that could be made in detecting bad elements for this type of projector, that can be made on a ship.

It appears that this may also be true for repair facilities, provided that the time required is reasonable. In view of this, Scientific-Atlanta will soon submit an unsolicited proposal to add certain features to the Pulse Vector Voltmeter, now under development, to automate this function.

4. Unsolicited Proposal concerning the Pulse Vector Voltmeter

Briefly, this proposal will be a recommendation that the scope of the contract be increased so that the Pulse Vector Voltmeter will be capable of reading either the real and reactive components of impedance, the magnitude and phase angle of

the impedance, or the real power with which the transducer is driven. It will be further recommended that equipment by developed to automatically collect this data from the elements of a complete transducer and print the results on a rectangular chart format with an automatic IBM electric typewriter. This feature is being recommended because it appears that up to three measurements on each of several hundred elements should be made to completely evaluate a transducer and the labor of switching and logging over a thousand measurements manually is undesirable. To implement this part of the proposal, a junction box will have to be built so that connections to the transducer under test will be made in a standard way, a scanner will be required to connect the elements one at a time, sequentially, to the measuring instruments, and a programmer will be required to operate the scanner, the IBM typewriter, and the pulsing system of the main console. Finally, it will be recommended that this equipment be formulated into a sub-measurement console, independent of the main console. This console will probably have the form of a single straight rack of equipment, which will contain the programmer, the pulse vector voltmeter, its power indicating sub-chassis, its Z-sub-chassis, its sampling box, the XY recorder, etc.

5. Government Furnished Equipment under Contract N00024-67-C-1385

Almost all of the equipment required to be delivered to the government by Scientific-Atlanta under this contract has been delivered. The four consoles will not be assembled until shortly before their delivery. Some of the line drivers on the original equipment list are no longer required in the systems, so they were not delivered. All of this equipment has been accepted by the area Naval Inspector and is presently being stored in the plant at Scientific-Atlanta.

6. Government Furnished Equipment for Contract N00024-67-C-1211

None of the equipment to be furnished by the government for use with this contract has been received. It was requested on 13 February 1967, and was due 13 June 1967. This matter was brought to the attention of the Director of the Atlanta regional DCASR on June 28th. This letter also notified DCASR that

the overall contract schedule would quite likely be delayed unless this equipment was delivered promptly. Mr. Herman Evans informed the contractor that these contracts were let on June 29th.

7. Visit By Personnel from Naval Ship Systems Command

The meeting referred to in paragraph C2a(3) took place at Scientific-Atlanta on June 8th and 9th. Messrs. Glenn Moore and Herman Evans attended from the Naval Ship Systems Command. Most of the information contained in this report was summarized and presented at that time. It was also agreed that the Research Department at Scientific-Atlanta, to which the responsibility for the major portion of the study effort under this contract has been assigned, would shortly submit a proposal which would re-evaluate this portion of the contract in light of present knowledge and submit a new proposal suggesting a redefinition of the scope of the study portion of the contract.

8. Rescheduling of Training Classes

The present contract allows for an in-house training program, scheduled to begin about the 1st of September, after the first system is checked out but before it is shipped. Representatives of the shipyards were to be invited to attend this program, at which time a familiarization and orientation program would be offered, with demonstrations being made on an actual system.

Since the start of this contract, Scientific-Atlanta has had several other contracts which required that a training session be conducted before shipment of the equipment. The results were not favorable, and the indication is that very little of what is presented in these sessions is retained. Far more favorable results have been obtained when such equipment is first placed in the customer's hands, and the training session is conducted shortly thereafter, on-site.

During this meeting, Scientific-Atlanta suggested that this part of the contract be indefinitely delayed. The two week installation and training sessions

that are conducted at the shipyard concurrent with the delivery of the system seems to be entirely adequate to train the operators. The ability to give personal attention to the operators, backed-up by reinforcing what they have been taught immediately, seems to be a far superior way to transmit this information. Messrs. Moore and Evans agreed. It was suggested that this time might be used after delivery of the last system to hold a symposium, at which time the problems in applying the instrumentation to the measurement situation at the various shipyards could be discussed and solutions offered.

9. Note Concerning Procurement of Polar Recorders by Naval Shipyards

The following information is presented for the information of those concerned. Each of the shipyards that will receive instrumentation systems under this contract have ordered polar recorders under separate contract numbers. Scientific-Atlanta was unable to coordinate these procurements so they were for identical instruments.

It is a policy of this company to offer consulting services to any customer to insure that he understands the equipment and purchases what is required to solve his problem. The contractor is particularly interested in offering this service in connection with any equipment procurement that furthers the desire of the Naval Ship Systems Command to establish standardized measurement instrumentation at various of its facilities.

10. Progress Performance and Schedule

Scientific-Atlanta Drawing Number C46036 is included in this report as an aid in evaluating the project performance and schedule. The numbers in the left-hand column represent individual tasks.

Task 00 Project Administration

The purpose of this task is to perform the administrative duties required by the contract that are not assignable to a specific system. It runs for the term of the contract, and there are no definitive milestones within the task upon which to report.

Task 10 System A

The purpose of this task is to assemble and checkout the first system. At the outset of the contract, System A would have been assigned to Pearl Harbor. Since Pearl Harbor was delivered the DRL system, System A will now be delivered to Mare Island. The delivery of the DRL system to Pearl Harbor did not change the scheduled delivery of System A. Assembly of this system should start August 1st. Checkout should be complete on September 1st. Since the GFE equipment required to complete this system has not been delivered to Scientific-Atlanta by the government, this schedule is likely to slip. Note that the in-house training (Task 50) was to have taken place upon completion of the checkout of System A and before shipment. Since the training will not be held, as has been discussed, the first two weeks of September are uncommitted. This means that the latest that the GFE equipment could arrive without delaying the contract would be August 15th. Assembly and checkout of System A would then take place from August 15th to September 15th. A period of two-weeks has been scheduled from September 15th to October 1st to allow for shipping and preliminary uncrating and installation at the shipyard. The installation of System A would begin on October 1st and end on October 15th.

Tasks 20, 30, and 40 Systems B, C, and D

These systems will follow the installation of System A, generally in the order indicated. It will be noted that they follow rather closely, so that a delay in shipping System A due to lack of the GFE will most likely be propagated through the remainder of the contract.

Tasks 11, 21, 31 and 41 Installation and Training

These tasks account for the installation of the four systems defined by tasks 10, 20, 30 and 40.

Task 43 Power Amplifier On-Site Checkout

This task is to provide evaluation of the CML power amplifiers after they have been installed with the second system to be delivered to the Boston Shipyard.

Task 44 Power Amplifier Liason/Interface

This task is approximately two and one-half months behind schedule because of a delay in issuing a contract to CML for the power amplifiers. This task is included to allow CML and Scientific-Atlanta to work together to solve interface problems between the transducer, the power amplifiers and the rest of the system. CML could not, of course, devote engineering time to this effort until they received a contract for their services.

Task 50 In-House Training

The delay in scheduling this task has already been discussed.

Task 81 Mechanical Interface Investigation

This task has been completed, since each of the shipyards has been visited so that, at the proper time, the required interface information can be exchanged.

Task 82, 83 Study

A discussion has already been given explaining the plans for submitting a recommendation with respect to the study portion of the contract.

Task 60 Pulse Vector Voltmeter

Progress on this development has been reported, together with an outline of the proposed unsolicited proposal to expand the scope of this portion of this portion of the contract.

Task 70 Manual

The purpose of this task is to provide a systems operation manual for the equipment. Much of the groundwork for this task has been laid by the work done on the DRL system. It is estimated that there will be no difficulty in delivering a manual with System A, as scheduled.

D. CONCLUSIONS

1. It would be helpful if the Naval Ship Systems Command could expedite delivery of the GFE equipment for contract N00024-67-C-1211.

2. It would be helpful if Scientific-Atlanta would be consulted prior to the purchase of any of its products for use at the shipyards in calibrating transducers if the standarization concept is to be maintained.

3. The training program that was to have been held at Scientific-Atlanta should be postponed.

4. Scientific-Atlanta should submit two proposals to the Naval Ship Systems Command as soon as possible. One proposal concerns the change involving the pulse vector voltmeter. The second proposal concerns a redefined scope of the study effort that should be undertaken.

5. The Defense Research Laboratory, University of Texas, should be consulted by the Naval Ship Systems Command, to see if they would care to loan the Pearl Harbor facility the high-power sampler that they had intended to add to the system had it been delivered to Austin as originally planned.

6. The Pearl Harbor Naval Shipyard should be sent at least one of the first 3KVA power amplifier modules that become available from CML so that their measurement capability is not limited.

7. Scientific-Atlanta should submit a proposal to the Naval Ship Systems Command to furnish Pearl Harbor with more convenient transducer positioning and handling mechanisms.

8. The Pearl Harbor facility should implement the suggestions made at the conclusion of the installation of their equipment as soon as possible.

PART II

PROGRAM FOR THE NEXT INTERVAL

The next interim report will be submitted after installation of the first system at Mare Island. This installation will begin about October 1st, 1967, unless it is delayed by not having received the GFE equipment to construct the console.

Development on the pulse vector voltmeter will continue. A report will be submitted on its status, and if a contract modification is made on the basis of the proposal being submitted, the additional equipment will be covered in the report as well.

If a contract modification is made with regard to the proposal being submitted withregard to the study portion of the contract, a report outlining progress made to date will be included in the next interim report.

PART III

SUPPLEMENTARY

The following section contains reproductions of significant correspondence that took place during the interval covered by this report.

APPLICATION		
QTY REQD	NEXT ASSY	USED ON

TASK NUMBER J402-	DESCRIPTION	ESTIMATED TARGET COST	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
60	PULSE VECTOR VOLTMETER	40,375			D 3413	3413	3413	S/NO 3413	S/N1 3108	PRELIMAN 3000	S/N2 6108	FINALMAN 3705	S/N3 3096	300
10	SYSTEM A	3,016								A C 9016				
20	SYSTEM B	7,995										A 5,995	C 2,000	
30	SYSTEM C	7,995												
40	SYSTEM D	7,995												
11	INSTALLATION & TRAINING - BOSTON 1	2,730										INSTALL 2730		
21	INSTALLATION & TRAINING - MARE ISLAND	2,918												INSTALL 2918
31	INSTALLATION & TRAINING PEARL HARBOR	3,186												
41	INSTALLATION & TRAINING - BOSTON 2	2,730												
43	POWER AMPLIFIER ON-SITE CHECKOUT- BOSTON 2	3,489												
50	IN-HOUSE TRAINING	2,648									TRAIN 2648			
70	MANUAL	8,173					PRELIMINARY 500	1000	1500	2000	FINAL 1173			
44	CML/SA POWER AMPLIFIER LIASON/INTERFACE	14,959					LIASON 234	234	CONSOLE 2234	SAMPLE 3564	INTERFACE 3851	MANUAL 3348	SHIP 1494	TEST
00	PROJECT ADMINISTRATION	10,371	FIRST QUARTER 259	259	259	260	SECOND QUARTER 345	346	346	THIRD QUARTER 345	346	346	FOURTH Q 345	346
81	MECHANICAL INTERFACE INVESTIGATION	7,831			PEARL MARE 6000	BOSTON 1831								
82	POSITIONING TECHNIQUES STUDY	7,060			REVIEW 176	1412	REVIEW 706	706	1412	SUMMARY 1412	1059	177		
83	MEASUREMENT TECHNIQUES STUDY	13,336					REVIEW 663	663	1335	2002	667	REVIEW 1335	2002	SUMMARY 1335
	TOTAL ESTIMATED TARGET COST	152,807	259	259	9,848	8,079	6,361	7,534	11,102	20,004	16,520	20,303	8,270	14,92
			JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC

QTY REQD	ITEM NO.	IDENTIFYING OR PART NO.

ALL DIMENSIONS ARE IN INCHES
UNLESS OTHERWISE SPECIFIED
TOLERANCES
THREE PLACES ± .005 FRACTIONS ± ____
TWO PLACES ± .015
ONE PLACE ± ANGLES ± 0° 30'
ABBREVIATIONS PER MIL—STD—12
DIMENSIONS PER MIL—STD—8
SCREW THREADS PER NBS H28 & MIL—STD—9
ELECTRICAL & ELECTRONIC SYMBOLS PER MIL—STD—15
REFERENCE DESIGNATIONS PER MIL—STD—16
SURFACE ROUGHNESS ✓ PER MIL—STD—10
ALL RESISTORS IN OHMS, ____% AND ____ WATT UNLESS OTHERWISE SPECIFIED
ALL CAPACITORS IN MICROFARADS UNLESS OTHERWISE SPECIFIED
LAST REFERENCE DESIGNATION USED
C ____ CR ____ J ____ K ____
Q ____ R ____ S ____
BREAK SHARP EDGES & CORNERS .005 to .015R
FINISH

DR BY	
ENGR	
CHK	
MATL	
PROJ	
PROD.	
APPD	
APPD	
APPD	

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APPLICATION			REVISIONS			
QTY REQD	NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVED

APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY
D		S/NO	S/N1	PRELIMAN	S/N2	FINAL MAN	S/N3		S/N4						
3413	3413	3413	3108	3000	6108	3705	3096	3000	2706						
				A C 9016											
						A C 5,995	2,000								
								A C 3,995	2000						
										A C 7,995					
						INSTALL 2730									
								INSTALL 2918							
										INSTALL 3186					
											INSTALL 2730				
												TEST 3489			
					TRAIN 2648										
PRELIMINARY					FINAL										
500	1000	1500	2000	2000	1173										
LIAISON			CONSOLE	SAMPLE	INTERFACE	MANUAL	SHIP	TEST							
234	234	2234		3564	3851	3348	1494								
SECOND QUARTER				THIRD QUARTER			FOURTH QUARTER			FIFTH QUARTER			FINAL SUMMARY		
260	345	346	346	345	346	346	345	346	346	345	346	346	1728	1729	1729
BOSTON 1831															
EW	REVIEW			SUMMARY											
1412	706	706	1412	1412	1059	177									
	REVIEW			REVIEW			SUMMARY								
663	663	1335	2002	667	1335	2002	1335	2670	664						
8,079	6,361	7,534	11,102	20,004	16,520	20,303	8,270	14,929	5,716	11,526	3,076	3,835	1,728	1,729	1,729
APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY

QTY REQD	ITEM NO.	IDENTIFYING OR PART NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL	STOCK SIZE	MATL SPEC	CODE IDENT

LIST OF MATERIALS OR PARTS LIST

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED
TOLERANCES
THREE PLACES ± .005 FRACTIONS ± ____
TWO PLACES ± .015
ONE PLACE ± ____ ANGLES ± 0° 30'

ABBREVIATIONS PER MIL—STD—12
DIMENSIONS PER MIL—STD—8
SCREW THREADS PER NBS H28 & MIL—STD—9
ELECTRICAL & ELECTRONIC SYMBOLS PER MIL—STD—15
REFERENCE DESIGNATIONS PER MIL—STD—16

SURFACE ROUGHNESS ✓ PER MIL—STD—10
ALL RESISTORS IN OHMS, ____% AND ____ WATT UNLESS OTHERWISE SPECIFIED

ALL CAPACITORS IN MICROFARADS UNLESS OTHERWISE SPECIFIED

LAST REFERENCE DESIGNATION USED
C ____ CR ____ J ____ K ____
Q ____ R ____ S ____

BREAK SHARP EDGES & CORNERS .005 to .015R

FINISH

		DATE
DR BY Johnson CN		3-24-67
ENGR		
CHK		
MATL		
PROJ		
PROD.		
APPD		
APPD		
APPD		

SCIENTIFIC-ATLANTA, INC.
3845 PLEASANTDALE RD., DORAVILLE, GA. BOX 13654, ATLANTA, GA. 30324

COST MILESTONE PLAN
J402-NAVAL SHIP SYSTEMS
COMMAND CONTRACT
NO N00024-67-C-1211

CODE IDENT NO.	SIZE	DRAWING NO.
10110	C	46036
SCALE		SHEET

1

2

March 21, 1967

Mr. Herman Evans
Ships 1622D
Naval Ship Systems Command
Munitions Building
19th and Constitution Ave., N. W.
Washington, D. C. 20360

Dear Herman:

During our recent visit to the Pearl Harbor and Mare Island Naval Shipyards, several observations were made that I feel should be directed to your attention immediately.

1. For Scientific-Atlanta to do an effective job in carrying out the intent of our contract, we need to collect a great deal of information with respect to the sonars that are now in fleet use, as well as those that might become operational in the near future.

The most urgent need in this respect, is to acquire knowledge about the electrical and physical characteristics of the projectors used with the various systems. From our discussions with the personnel at the yards, and those present from DRL and NEL, it seemed that there was no single repository of such knowledge.

I found that it was quite common to refer to the transducer by an AN/SQS number, which of course designates only the general sonar system with which a given transducer may be used. Within a system may be five or more different projectors, designated by a TR-XXX number. These numbers may at various times designate different models of systems in use, or represent obsolete designs.

I also encountered various opinions on how much descriptive knowledge of this type is in existence. At Pearl, someone remarked that there was practically no material of this nature in existence, that "perhaps GE published something or other on one or two projectors". On the other hand, at Mare, some of the people felt that most of their test procedures evolved from technical manuals published for the projectors, but they didn't know where they were or who might have them.

I think you can easily see how much more effective we could be in communicating with the shipyards, and in anticipating their measurement needs, if we had information of this type.

I would greatly appreciate it if you would try to find means for us to obtain this information, or to send us any information of this nature that you may have in your possession.

2. I gained a great deal of insight by observing the production repair activities at the two yards. It is apparant to me, particularly with respect to the facility at Mare Island, that a great deal of attention needs to be devoted to the interface problem - that is - how our equipment will be connected to the projectors.

Although the equipment that Scientific-Atlanta is furnishing is unquestionably superior to anything that they now have at either of the two shipyards visited, it is, as it now is being furnished, more of a research than a production repair tool.

The link that is missing, is the lack of consideration of the interface with the projector. The other interface problems, with primary wiring, with positioners, with test hydrophones, etc., are not difficult to solve, and were within the intended scope of the contract. However it was not within the intended scope of the contract to build a system that was capable of rapid-fire repeated tests on a great number of elements. This is essentially what the shipyards do.

At a later date, we will have much more to say about the way that tests are performed in evaluating these transducers. Of immediate concern now, before any of the equipment is shipped, is how to allow the yards to carry over their present test procedures to our equipment. To emphasize how urgent this requirement is, I feel that we would effectively close down a facility such as Mare Island, if we should install our equipment without considering the production repair methods now used.

Because of the urgency of this matter, I will shortly be giving you two sets of recommendations with respect to the interface problem.

The first recommendation will be concerned with the operation of the DRL console at Pearl Harbor. Four areas need to be considered:

a. The design of a new sampling box for our EI Normalizer to handle their 2.8 KVA power amplifier.

b. The design of an input panel to solve the interface between the test hydrophone, the calibrator, and the differential preamplifier.

c. The design of an output panel to solve the interface problem between their power amplifier input terminal and our console.

d. The design of AC power line filters.

The second recommendation will be broader in scope. It will deal primarily with a proposed solution to the production testing of complete transducer arrays, such as is now done at Mare Island.

3. I wish to bring a third observation to your attention. At both Pearl Harbor

and Mare Island, the bulk of the work seems to be the repair and evaluation of high-power projectors. It was stated to me at both locations that low power transducers, especially hydrophones, are quite often not repaired for economic reasons. However, what concerned me was that at both yards, what work was done, was being performed at a separate facility. Our equipment is capable of evaluating all transducers. Thus it would seem that unless all work was moved to one location, our equipment will end up being used to test high-level devices, and the low-level work will continue being done at the second site with the present obsolete equipment. In such an instance, a great deal of the instrumentation in our system would not be very effective.

4. Finally, I feel that Scientific-Atlanta and the Naval Ship Systems Command should generate something that more clearly defines the scope of the study portion of our contract than now exists. I think that this should be done, even if our contaactual obligations were well defined - for the benefit of others who are interested in this overall optimized facility concept.

You and Hugo will undoubtedly be discussing some of these points when you meet in Boston, especially in light of what you might discover there. I think the time then would be proper to consider a technical meeting at Scientific-Atlanta with at least some of the members of the "Calibration Committee" to discuss some of these points in greater detail.

Sincerely,

SCIENTIFIC-ATLANTA, INC.

Curtis E. James
Product Manager
Underwater Sound Instrumentation

CEJ/dk
cc: Scientific-Atlanta, Inc.
5801 Annapolis Road
Hyattsville, Maryland 20784
301-779-1515

March 28, 1967

Mr. Herman Evans
Ships 1622D
Naval Ship Systems Command
19th and Constitution Avenue, N. W.
Washington, D. C. 20360

Dear Herman:

Hugo and I would like to try to arrange the visit to the Boston Naval Shipyard for Tuesday April 18 and Wednesday April 19.

We would like to return to Washington with you on Wednesday evening and, provided you concur, meet with you and Glenn Moore on Thursday morning, April 20. I have attached to this letter a brief description of the topics that need to be discussed during this meeting.

I received the letter that you mailed concerning the plan for the Standardized Naval Shipyard Transducer Calibration Program. Enclosure 1 to this letter was attached, but enclosure 2 was not. Did you intend to omit it?

The DRL system seems to be proceeding on schedule. We have all of the equipment mounted into the console, except for a few items that are running late from vendors. I don't anticipate any problem in meeting our intended shipping date of April 24, 1967.

Please call me and confirm the dates given for the visit to Boston and the meeting with Glenn. I hope that we can make these dates, because the following week I will be pretty well tied up in getting ready to ship DRL.

Sincerely,

SCIENTIFIC-ATLANTA, INC.

Curtis E. James
Product Manager
Underwater Sound Instrumentation

CEJ/dk
Enclosure
cc: Scientific-Atlanta, Inc.
5801 Annapolis Road
Hyattsville, Maryland 20784
301-779-1515

Points that need to be clarified with NSSC after trip to Boston Shipyard.

1. Redefinition of intended scope of Scientific-Atlanta's study program.

   a. Is scope as defined in proposal consistent with NSSC intent?

   b. What is relationship of study to SRI's function to supply standardized calibration methods as indicated by Herman's letter?

   c. What is relationship of study to DRL's participation in program?

      (1) In view of Dudley Baker's remark that he does not think it was NSSC's intent to recommend test methods.

      (2) In view of Dudley Baker's remark that they are working on equipment (hardware) to implement some standard test methods.

2. Unless modified during the discussion of point 1 above, it would appear that SRI has been commissioned to recommend standardized calibration procedures, and a Naval Laboratory (NEL ?) will shortly be commissioned to give training lectures.

   Scientific-Atlanta will be inviting shipyard personnel to a two week training session in Atlanta about August or September. At this time it will be impossible not to touch upon the two areas above. How can a coordinated picture be presented on Scientific-Atlanta's timetable? How can above be coordinated with system manual?

3. Scientific-Atlanta has recognized that a potentially serious situation will exist unless considerable effort be expended to solve the production-orientated (rather than engineering evaluation orientated) approach to testing that seems to be required for a transducer repair facility.

   Part of an effective recommendation toward solving this interface problem is a knowledge of what might evolve from a standard calibration methods recommendation. How is this to be scheduled, considering the equipment delivery timetable, so as not to impair the capacity of the various repair facilities?

4. Scientific-Atlanta has noted that at both Pearl Harbor and San Francisco (Boston has not been visited at this date), separate facilities are maintained for high-power projector testing and low-power hydrophone testing. Scientific-Atlanta's console contains equipment appropriate to both types of tests. As an observer, it is not clear what effect having all of this equipment at the one facility will have.

5. It is Scientific-Atlanta's opinion that the order in which equipment is to be delivered to the shipyards is not to be the order specified in the contract. If this is so, the correct order needs to be defined so that problems peculiar to that shipyard may be solved concurrent with delivery of their system.

6. The effectiveness of Scientific-Atlanta's training lectures, manuals, and solutions to interface problems depends somewhat upon acquiring data in the following two primary areas. We would welcome suggestions on how to collect this data.

   a. Specific detailed knowledge of present transducers, known test procedures, model numbers, system numbers, etc.

   b. Means of having disseminated to us knowledge that now rests rather informally in the hands of various consultants (NEL, DRL, SRI, etc.)

April 7, 1967

Pearl Harbor Naval Shipyard
Box 400
Fleet Post Office
San Francisco, California 96610

Reference: Code 2390, 31 March 1967

Attention: J. B. Wilcox, Lt., USN
Combat Systems Superintendent

Dear Lt. Wilcox:

I have received the above referenced letter, with its enclosures. I am sending you in return, some information to help in coordinating the installation of the equipment. I will shortly be able to officially inform you of the shipping date. At this time the project appears to be on schedule, and we anticipate shipping in two or three weeks.

I am curious as to the progress you might have made in getting the FQM training mechanism to operate in a rate mode. If I can be of any help here, please let me know.

I am also wondering if you have had an opportunity to inspect the AC power lines at the wet slip for transient voltage spikes and regulation.

Please let me know if I have any statements in the enclosure that you do not understand.

Sincerely,

SCIENTIFIC-ATLANTA, INC.

Curtis E. James
Product Manager
Underwater Sound Instrumentation

CEJ/dk
Enclosure
cc: Scientific-Atlanta, Inc.
5801 Annapolis Road
Hyattsville, Maryland 20784

D. D. Baker
Herman Evans

DISCUSSION OF INTERFACE REQUIREMENTS

1. This enclosure deliniates the actions required by Scientific-Atlanta and the Pearl Harbor Naval Shipyard (PHNSY) to effect a coordinated effort in solving the interface requirements between the existing equipment at Pearl and the Scientific-Atlanta instrumentation console.
2. With reference to the information sent to SA on March 31:
   a. Am I correct to assume that the two racks shown on the set of four sketches is the same as the "power amplifier" shown on drawing 21-67? Do these racks also contain the magnetic servo amplifier for the FQM training mechanism?
   b. Should not the capacitor matching network and the sampling unit be interchanged? The answer depends upon what you consider to be external to the stave you are measuring.
3. The following points concern equipment racks 1 and 2 that you are providing:
   a. The input connections to the power amplifier are shown on sheet four of the set of sketches. I recommend that the ground at TB-8, terminal 1 be removed. PHNSY should make the cable to connect the input of the power amplifier to the SA console. It is recommended that you use RG 59A/U coaxial cable. Terminate the console end of the cable with a standard BNC-series connector. Terminate the power amplifier end of the cable at TB-8, terminals 1 and 2. SA will furnish a precision 75-ohm shunt that should also be connected across these two terminals. In order to get the length of the cable correct, assume that the mating connector for

this cable is located at the rear of the console on the bottom, near the middle.

b. The input and output connections to the sampling unit are shown on page two of the set of sketches. The details are not quite correct. Attachment 1 to this letter gives the interface requirements. Note from this attachment that PHNSY is to furnish two cables, and furnish information so that SA can make three cables.

c. The tentative layout of the equipment in rack 1 and 2 is shown on sheet 1 of the set of sketches.

(1) The EI sampling unit is $3\frac{1}{2}$ inches high.

(2) The following additional equipment should also be mounted in these racks:

Rack Panel Heigth (Inches)	
14	General Radio Megohmeter
7	Ballantine VTMV
$5\frac{1}{4}$	Hewlett-Packard Volt-Ohmeter
14	Moseley XY Recorder
15-3/4	Dranetz Impedance Meter
(PHNSY)	Oscillator
$3\frac{1}{2}$	Sweep Drive

(3) Provisions must be made for furnishing AC power to each of these units.

(4) The first three items have been furnished under the contract to round out the instrumentation compliment of the facility. They may be mounted and used as desired.

(5) The last four items are used to make low-level CW impedance measurements. Of these, the last two items are not furnished under this contract.

(6) The XY recorder will require three cables. Two of these cables will be used to connect the Y1 and Y2 recorder inputs to the R and X voltage outputs from the Dranetz Impedance Meter. The third cable will be used to connect the Z-axis recorder input to the interface panel on the SA console. This cable will be used to furnish to

the recorder, an analog voltage that is proportional to frequency. Attachment 2 to this letter describes how PHNSY should fabricate the cable. The mating connector will be furnished by SA.

(7) Since the oscillator is not being furnished under this contract, it is recommended that PHNSY attempt to utilize one that already exists. Its output is required to go to the Dranetz Impedance Meter. In order that the oscillator's output voltage remain flat with frequency, and to preserve the accuracy of any attenuator it might have, a resistive load should be connected across the input terminals of the Dranetz equipment that is equal to the output impedance of the oscillator.

(8) Since the sweep drive is not being furnished under this contract either, it is recommended that PHNSY move one of the sweep drives mounted in the SA console for use with the Hewlett-Packard wave analyzer to the rack, and mount it just under the oscillator. When Scientific-Atlanta personnel come to Pearl Harbor for the check-out of the system, a selection of timing belts and gears will be made to permit the oscillators frequency control shaft to be mechanically linked to the sweep drive mechanism.

(9) The Dranetz equipment has not been received at Scientific-Atlanta yet, therefore furthur recommendations concerning its interface cables cannot be made. One requirement that can be anticipated, however, is the necessity of having some convenient way of connecting it so that individual staves can be switched into its input. A manual has been requested from the vendor, and as soon as it can be studied, more information concerning its interconnection with the other equipment will be forwarded.

4. The system will be supplied with provisions for using TR-205 hydrophones. It is assumed that all such hydrophones will have sufficient cable to reach the front of the SA console, where the differential input preamplifier will be mounted. All calibrations of the hydrophone's sensitivity will be made at this point.

   A. Scientific-Atlanta will send to PHNSY, two adapter cables. These are to be used with the two types of identical hydrophones but which have different connectors. Each adapter cable will be pre-wired at one end with a connector that mates with the preamplifier. PHNSY will furnish and install on the other end of these adapter cables, one each of the two types of connectors found on the TR-205 hydrophones commonly used. Attachment 3 to this letter describes how the fabrication of these cables is to be completed by PHNSY.

   B. For a matter of record here, Scientific-Atlanta will furnish a third adapter cable, which will be used in calibrating the hydrophones. This adapter will be shipped with the system, and instructions in its use will be part of the on-site checkout and instruction.

5. It was agreed during the meeting at Pearl Harbor that PHNSY would make a positioner control panel, $5\frac{1}{4}$ inches high, to operate the rate mode of the present FQM training mechanism. This panel would contain wiring very similar to that shown in Figure 2-23 of the FQM manual, less the wiring associated with B1601and B 1602. These were the indicator and control synchros, and are no longer used.

   A. Scientific-Atlanta would like to recommend that the terminal board, TB 1601 in Figure 2-23 not be used, but that a chassis-mounting connector be employed instead. If PHNSY will then furnish SA the model number and the description of the connector chosen, SA will fabricate and install in the console, a cable which will mate at one end with the connector on PHNSY's control panel, and will terminate at the other end with a bulkhead mounted connector on the console's rear

interface panel.

B. PHNSY will then provide a cable to connect the connector on the console interface panel to the magnetic servo amplifier. It will be assumed that PHNSY will be responsible for the proper operation of the rest of the training mechanism, such as connection to the AC power lines, limit switches, etc. One exception is that the present synchros in the FQM training mechanism must be handled as described in the next paragraph.

5. It had been decided during the meeting at Pearl that the synchros in the present FQM training mechanism could be used to furnish the positioning information required by equipment in the SA console.

A. Scientific-Atlanta will furnish to PHNSY an MS 3106A-20-7P connector. This will mate with a connector on the console's interface panel.

B. PHNSY will use this connector to fabricate a cable to connect the synchros in the FQM training mechanism to the console. This connector must be wired as follows:

Pin No.	Function
A	1:1 synchro, R1
B	36:1 synchro R1
C	1:1 and 36:1 synchros R2
D	1:1 synchro S1
E	1:1 synchro S3
F	36:1 synchro S3
G	36:1 synchro S1
H	1:1 and 36:1 synchros S2

6. Scientific-Atlanta consoles are wired as indicated on Attachments 4 and 5 to this letter. The AC receptacle referred to by "Note 1" and labelled "Customer's Service" should be furnished by PHNSY. This receptacle is identified by the letter which accompanies the sketch.

It normally mounts in a 4 X 4 inch square receptacle box.

A. Using this approach, the console may be unplugged at the wall. An entirely satisfactory alternative, is to cut the plug off the end of the consoles power cable, and permanently connect the remaining wires into circuit A5, as shown on your drawing 21-67. The console would then be unplugged by unscrewing the connector at the console end of the power cable.

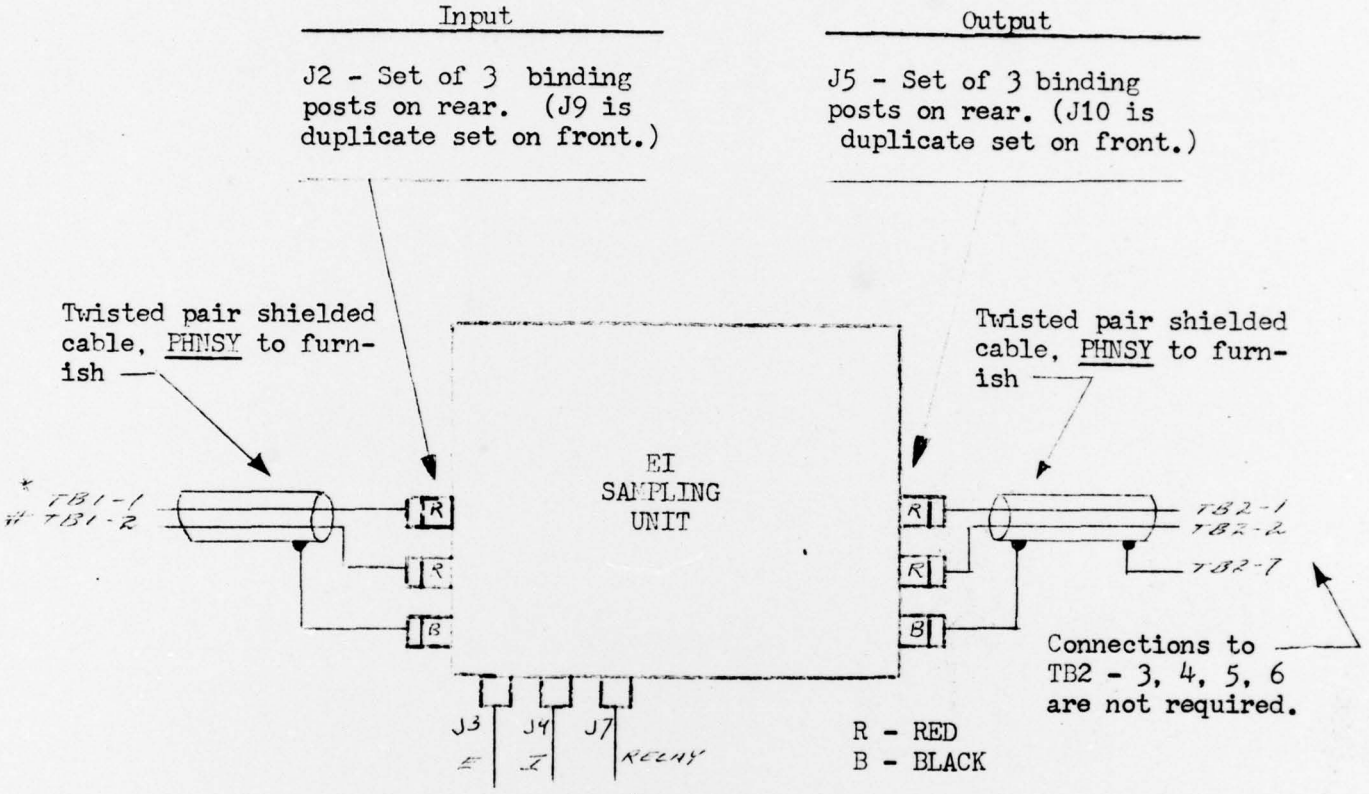
B. Using either approach, PHNSY should wire the building so that pins X and Y are tied in parallel, and go to the "hot" side of the AC line. Pin W should go to the "Neutral" side of the circuit. Pin G should go to the AC wiring ground.

C. In order to allow for the maximum flexibility in solving any AC ground loop problems that might arise during checkout at Pearl, it would be convenient to have a threaded stud inserted through the wall of the building so that ground wires could be attached to it from both the inside and the outside. The object would be to strap the console electrically to the building frame, then run a salt-water ground from the outside. It might also be necessary to experiment with running a separate equipment grounding conductor to the salt-water.

7. Scientific-Atlanta will provide a BNC-type connector on the console's rear interface panel to provide the drive signal for the power amplifier. PHNSY will fabricate a cable to connect this to the power amplifier.

8. During the meeting at Pearl, PHNSY agreed to investigate the AC power line for voltage regulation and transient spikes of voltage. They were to provide line voltage regulation if it were required. Scientific-Atlanta agreed to provide information on a satisfactory RFI filter, it is seemed that these were required. SA has had good results using Sprague type 40JX11 RFI Filters. These are in stock and cost $63.75.

ATTACHMENT 1

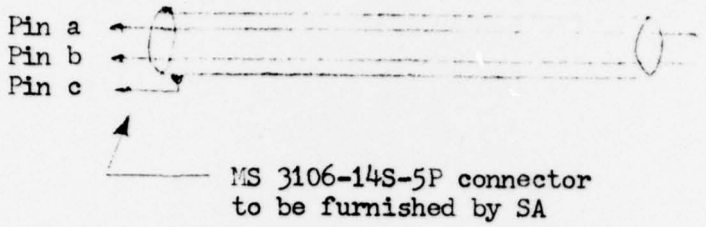


*,# If sample box and capacitor box are interchanged, (see paragraph 2b of cover letter) then,

* T-3 secondary high
\# T-3 secondary low

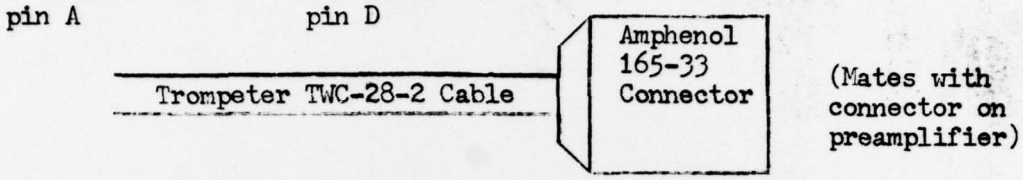
SA will fabricate and send these three cables. They connect to the console interface panel. PHNSY is to furnish conservative estimate of length required. Interface panel is at the middle, bottom, rear of the console.

ATTACHMENT 2



PHNSY-furnished X-axis cable for XY recorder

ATTACHMENT 3



PHNSY is to add mating connectors as follows:

Pin A - Blue - Hydrophone High

Pin B - White - Hydrophone Low

Pin D - Shield - Must go to shield of hydrophone's cable.

Sketch showing method of completing fabrication of Hydrophone Adapter Cables to be furnished by SA.

P. O. Box 13654
Atlanta, Ga. 30324
Tel. 404-938-2930
TWX 810-766-4912

Gentlemen:

To coordinate the installation of the control console being furnished by Scientific-Atlanta on the referenced purchase order the cognizant engineer will require the following information:

The line power requirement for the control console is approximately _____ watts assuming the positioner control unit is furnishing positioner drive power at full rated load. If the positioner loading during operation is not considered, the console power requirement is approximately _____watts.

As indicated in enclosure 1, we are furnishing a 6-foot extension cable terminated with a NEMA type 14-30 P plug (Hubbel Type 9432, Arrow-Hart Type 5732, or equivalent). This will require installation of 115/230 volt, 3-pole, 4-wire service terminated with a NEMA type 14-30R receptacle (Hubbel Type 9430, Arrow-Hart Type 5743, or equivalent).

The console end of the extension cable will be terminated with a type MS 3106A-22-22S connector and its mating connector will be mounted on the console. The power line wiring internal to the console will be such that the instrumentation equipment will be divided approximately equally between the 115 V phase X to W and the 115 V phase Y to W.

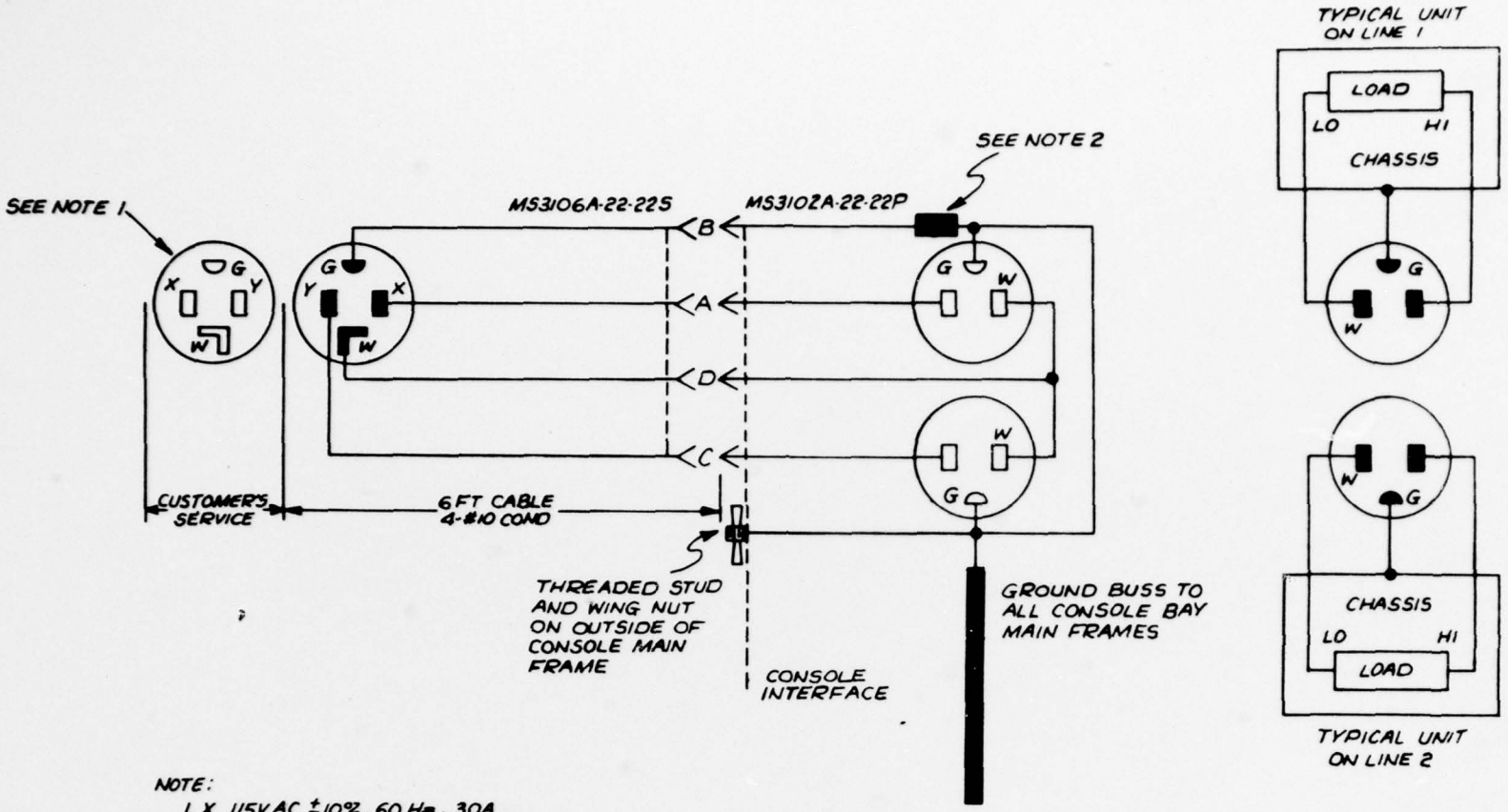
Very truly yours,

SCIENTIFIC-ATLANTA, INC.

Howard L. Crispin
Marketing Manager
Antenna Instrumentation

HLC:mjw

Enclosure



NOTE:

1. X 115V AC ±10%, 60 Hz, 30A
   Y 115V AC ±10%, 60 Hz, 30A, ANY PHASE OTHER THAN THAT OF X
   W SERVICE SYSTEM GROUND
   G EQUIPMENT GROUND
2. REMOVE THIS STRAP AND CONNECT WING NUT TO MORE SUITABLE EQUIPMENT GROUND IN DIFFICULT INSTALLATIONS
3. IF CONSOLE LOAD IS LESS THAN 30 AMP, AND IF ONE PHASE ONLY IS AVAILABLE, CUSTOMER MAY PARALLEL X AND Y IN HIS SERVICE

3-Pole, 4-Wire Power System

May 3, 1967

Pearl Harbor Naval Shipyard
Box 400
Fleet Post Office
San Francisco, California 96610

Reference: Code 2390, 25 April 1967

Attention: J. A. Woodman
Combat Systems Superintendent, Acting

Dear Mr. Woodman:

I received your above referenced letter and will answer the questions you asked under ADDITIONAL RACK MOUNTED EQUIPMENT.

Since our visit to Pearl Harbor, we have also inspected the facilities at Mare Island and Boston. It was apparant that the original console layout would have been awkward to use. For this reason I recommended in my letter of April 7 that some equipment be removed from the console so that it could be mounted in a separate rack, near the point in the facility where the cable from the transducer were more accessible. Essentially, the equipment I removed is the equipment that would be used in making low-level CW impedance measurements on the elements. Since the cable from the transducer goes to the power amplifier, not the SA console, you can see how awkward it would be to make connections to, for example, the Dranetz Impedance Meter. The only disadvantage to moving the equipment out of the SA console is that the oscillator that is needed during these impedance tests must stay in the console for other tests. I thought it would be easier if you provided an oscillator from your present set-up. As to the sweep drive, there are three in the system, and I suggested temporarily removing the least used of those to drive the dial of your oscillator. You were not to worry about the mechanical interface between the oscillator and the sweep drive, as I would attempt to bring with me enough timing belts and gears to find a set that could be used to link them together.

When all seven pieces of equipment are arranged in a separate rack as I had envisioned, then all of the impedance measurements can be made at one location. These tests would be independent of the rest of the equipment in the SA console. Upon completion of these tests, the operator can move over to the SA console and do all of the other testing that will be required.

The direct answer to your question then is -- no, the Moseley XY Recorder and Dranetz Impedance Meter are not in addition to those shown on our original console layout.

I am mailing, at the same time as this letter, a box of cables and connectors,

clearly identified, to be used in preparing your site for the interface of all equipments. More details will be found in my last letter. I will put a copy of the enclosure to this letter in the box with the cables to make sure that they get together.

We did encounter one problem. We have been informed by the manufacturer, ITT Cannon Electric, that the CA3106A20-27S-A95-F32 connector that you are using on the control panel you designed for the FQM training mechanism is a special connector with gold over silver plate contacts and tapered terminals. Although there will be no mating problem with the standard line of connectors, they did not recommending mixing the gold contacts with other metal. Since the application does not involve low-level signals, I do not think this is a serious problem. However, if you want to do the extra work and play it safe, I am sending you a standard equivalent of what you are using, so you can use it instead of what you proposed.

The console checkout is proceeding nicely - - I should be able to wrap it up for shipping toward the end of this week. I understand that it will fly to San Francisco and to Honolulu on United Airlines from there. There are four planes a week out of Honolulu that can carry the equipment. The first possible flight the equipment could be put on, if space were available, would be next Tuesday morning. It would be in Honolulu about noon. I don't know how long it will take from there to the wet-slip. I will send you a telegram with all of the routing information, schedule and way-bill numbers as soon as they are available from the carrier. I understand it will be shipped collect and converted to a GBL at the destination.

Please write to me if any part of this information is not clear.

Sincerely,

SCIENTIFIC-ATLANTA, INC.

Curtis E. James
Product Manager
Underwater Sound Instrumentation

CEJ/dk
Enclosure
cc: Scientific-Atlanta, Inc.
Braniff Tower - Suite 435
Dallas, Texas 75235

D. D. Baker
DRL, Univ. of Texas
Austin, Texas

Herman Evans
Naval Ship Systems Command
Washington, D. C.

IDENTIFICATION OF INTERFACE CABLES AND PLUGS SENT TO PEARL HARBOR SHIPYARD IN ADVANCE OF THE INSTRUMENTATION.

1. The two cables made of the blue-jacketed coax have the proper connectors at one end to mate with the SA 1116-1 Preamplifier. You are to pick the two connectors that are most often found on your test hydrophones and complete them. The correct schematic diagram was shown in ATTACHMENT 3 to my last letter.

2. The 8-pin connector is the MS 3106A-20-7P connector required to terminate the console-end of the cable whose further end connects to the synchros in the FQM training mechanism. This was discussed in paragraph 5 of the attachment to my last letter -- and a table listing the connections that must be made is tabulated there.

3. The three long cables are used to connect the SA console to the EI Normalizers sampling box, located in the remote console. This is shown in ATTACHMENT 1 of the enclosure to my last letter. They are being sent to you now just in case you have a special way of routing cables between the two consoles and want to install them. If not, just hold them for arrival of the equipment and install them as shown. They are identified on my attachment as being used at J3, J4 and J7.

4. The four pin connector is the MS 3106A-14S-5P connector shown in ATTACHMENT 2 to my last letter. It is discussed in paragraph 6.

5. The BNC-type connector is being furnished to you for the cable discussed in paragraph 3a of the attachment to my last letter. It will mate at the console with a connector that will furnish the drive signal for your power amplifier. As indicated in my letter, it was recommended that you use RG 59A/U coaxial cable here. The far end is to be connected as required to the power amplifiers input terminals. I have put the precision resistor mentioned in my letter in the package with the connector. It is the one that is to be used across the input terminals to your power amplifier.

6. The 14-pin connector is the one I referred to in this letter. You can use it if you wish, to replace the one you proposed to use on the control panel you designed for the FQM.